CHAPTER 3

System Specifications

This section lists specific site preparation specifications for each Cisco product. Included are any special requirements for your system, such as rack-mounting options, special power requirements, or external cable connections (where available or required).

The following is a list of the Cisco products covered in this section:

- Cisco 760 Series, page 2
- Cisco 1000 Series, page 3
- Cisco 2500 Series, page 9
- Cisco 3600 Series, page 12
- Cisco 4000 Series, page 14
- Cisco AS5200 Universal Access Server, page 16
- Cisco 7500 Series, page 18
- Cisco 7200 Series, page 26
- Cisco LightStream 1010, page 28
- Catalyst 1900(r), page 31
- Catalyst 2820, page 33
- Catalyst 3000, page 35
- Catalyst 5000, page 37
- Catalyst WS-C1400 Concentrator, page 39
- FastHub 100 Series, page 41
- Cisco IGX 8400 Series Family, page 42
- BPX 8600 Series Wide Area Switch, page 47
- MGX 8220 Edge Concentrator, page 53

Cisco 760 Series

This section contains physical specifications and external connection requirements for the Cisco 760 series routers, which includes the Cisco 765 and Cisco 766.

Physical Specifications

Table 3-1 lists the physical specifications for the Cisco 760 series routers.

Table 3-1 Cisco 760 Series Physical Specifications

Description	Specification
Dimensions (H x W x D)	1.6 x 8.3 x 9.6 in (4.1 x 21.1 x 24.4 cm)
Weight	
— Cisco 765	1.6 lb. (0.7 kg)
— Cisco 766	1.7 lb. (0.8 kg)
Power supply	External
Voltage	100-250 VAC
Frequency	50 to 60 Hz
Operating temperature	32 to 120 F (0 to 50 C)
Storage temperature	– 30 to 160 F (– 35 to 70 C)
Operating humidity	20% to 95%, noncondensing

External Connections

This section contains the external connection requirements for the Cisco 760 series routers.

- ISDN Basic Rate Interfaces (BRIs)
  - ISDN S/T using an RJ-45 connector
  - ISDN U using an RJ-45 connector
- Supported Ethernet Interfaces
  - Ethernet 10BaseT using an RJ-45 connector
  - Ethernet 10Base2 using a BNC connector
  - Ethernet attachment unit interface (AUI) using a DB-15 connector
- Basic telephone service interface using an RJ-11 connector
- Console configuration port using a DB-9F 9-pin female connector

Cisco 1000 Series

This section contains the physical specifications and external connection requirements for the Cisco 1000 series, which includes the following models: the Cisco 1001 LAN Extender, the Cisco 1003, Cisco 1004, and the Cisco 1005 routers.

Physical Specifications

Table 3-2 lists the physical specifications for the Cisco 1000 series models.

Table 3-2 Cisco 1000 Series Physical Specifications

Description	Design Specification
Dimensions (H x W x D)	1.75 x 8.0 x 8.3 in (4.5 x 20. x 21 cm)
Weight	6.0 lb (2.75 kg)
Input voltage	12 VDC External power supply: 100 to 240 VAC
Frequency	50 to 60 Hz
Power dissipation	12W (maximum), 135.5 Btus/hour
Operating temperature	32 to 104 F (0 to 40 C)
Nonoperating temperature	– 40 to 185 F (– 40 to 85 C)
Humidity (noncondensing)	10 to 90%

External Connections

This section contains the external connection requirements for the Cisco 1000 series.

- Ethernet attachment unit interface (AUI) using a DB-15 connector
- Ethernet 10BaseT interface using an RJ-45 connector.
- X.21 synchronous serial, data terminal equipment (DTE) interface, using a DB-15 connector.
- V.35 synchronous serial, nonreturn to zero (NRZ) interface, using a 34-pin connector.
- ISDN BRI interface using an RJ-45 connector. The port is labeled “ISDN S/T” on the Cisco 1003 router and “ISDN U” on the Cisco 1004 router. The Cisco 1004 router includes an integrated NT1 device.
- Synchronous serial port using a DB-60 connector. Supports the following interfaces: EIA/TIA-232, EIA/TIA-449, V.35, X.21, and EIA-530.
- EIA/TIA-232 console port using an RJ-45 connector.
- EIA/TIA-232 console/asynchronous serial port using an RJ-45 connector.
- One external PCMCIA Type-2 slot for an integrated modem, V.34 speed.

Cisco ConfigMaker Specifications

Cisco ConfigMaker is a wizards-based software tool that helps you to quickly and easily configure and address the Cisco 1000, 1600, 2500, and 3600 products. The Cisco ConfigMaker CD-ROM ships in the software feature pack for these products, or it can be downloaded from the following URL:

Table 3-4 contains the specifications for ConfigMaker.

Table 3-3 Cisco ConfigMaker Specifications

Description	Minimum Requirements
Operating system	Windows 95 or Windws NT 4.0
Processor	Pentium or equivalent 486 computer
Hard disk space	12 MB
RAM	16 MB
Monitor	SVGA with 640 x 460 pixels, 256 colors
Drives	CD-ROM

Cisco 1600 Series

Standard Features and Specifications

Table 3-4 Cisco 1600 Product Family Summary of Features

Model	Cisco 1601	Cisco 1602	Cisco 1603	Cisco 1604	Cisco 1605-R
Base Configuration	• 1 Ethernet • 1 serial, sync/async	• 1 Ethernet • 1 56-kbps 4-wire DSU/CSU	• 1 Ethernet • 1 ISDN BRI S/T	• 1 Ethernet • 1 ISDN BRI U (with NT1)	• 2 Ethernets • 1 WAN interface card slot
Supported Optional WAN Interface Card	• Serial sync/async • 56/64K DSU/CSU • ISDN BRI S/T (dial & leased line) • ISDN BRI U (dial & leased line) • T1/Fractional T1 DSU/CSU		• Serial sync/async • 56/64K DSU/CSU • ISDN BRI Leased Line S/T		• Serial sync/async • 56/64K DSU/CSU • ISDN BRI S/T • ISDN BRI U
Processor	Motorola 68360 at 33MHz				Motorola 68360 at 33MHz
Memory Architecture	Run from flash				Run from RAM
Default DRAM Memory	2 MB				8 MB
Maximum DRAM Memory	18 MB				24 MB
Default Flash Memory	4 MB				2 MB
Maximum Flash Memory	16 MB				16 MB
Console Port	RJ-45				RJ-45
LAN Connector	10BaseT (RJ-45) & AUI (DB-15)				• Ethernet 1: 10BaseT (RJ-45) & AUI (DB-15) • Ethernet 2: 10BaseT (RJ-45)
WAN Connector	DB-60	RJ-48S	RJ-45	RJ-45	Per WAN Interface Card

Table 3-5 Serial Interfaces Supported by the Cisco 1601 and 1602 Routers and Serial WAN Interface Cards

	Cisco 1601 On-board WAN	Cisco 1602 On-board WAN	WIC-1T Card	WIC-1DSU-56K 4 Card	WIC-1DSU-T1 Card
Asynchronous serial connection over basic analog telephone	Up to 115.2 kbps	Not supported	Up to 115.2 kbps	Not supported	Up to 115.2 kbps
Synchronous serial connections:					
Leased Line / Digital Data Service (DDS)	Up to 2.0 Mbps with external DSU/CSU	56 kbps	Up to 2.0 Mbps with external DSU/CSU	56 or 64 kbps	56 or 64 kbps
Switched 56	56 kbps with external DSU/CSU	56 kbps	56 kbps with external DSU/CSU	56 kbps	56 kbps

- Asynchronous serial protocols: Point-to-Point Protocol (PPP), Serial Line Internet Protocol (SLIP)
- Asynchronous interface: EIA/TIA-232
- Synchronous serial WAN services: Frame Relay, X.25, SMDS
- Synchronous serial protocols: PPP, HDLC, LAPB, IBM/SNA
- Synchronous serial interfaces supported on Cisco 1601 and WIC-1T card: EIA/TIA-232, V.35, X.21, EIA/TIA-449, EIA-530

Table 3-6 ISDN Interfaces Supported by the Cisco 1603 and 1604 Routers and ISDN WAN Interface Cards

Feature	Cisco 1603/1604 On-board WAN	WIC-1B-S/T card	WIC-1B-U card	WIC-1B-S/T-LL card
ISDN dialup	X	X	X	Not supported
ISDN Leased Line 64 kbps	Rel 11.1	Rel 11.1	Rel 11.1	Rel 11.2(9)P[1]
ISDN Leased Line 128 kbps	Rel 11.3(1)	Rel 11.3(1)	Rel 11.3(1)	Q2’98
Frame Relay encapsulation over ISDN Leased Line	X	X	X	X
PPP encapsulation over ISDN Leased Line	X	X	X	X
PPP compression (up to 4:1)	X	X	X	X

1. 64 kbps ISDN leased line support on the WIC-1B-S/T-LL card is available on B1 channel only. 128kbps ISDN leased line support on the WIC-1B-S/T-LL leased line card is expected on Cisco IOS Release 11.3(3)T in Q2’98.

Table 3-7 Cisco 1600 Series Environmental Specifications

Description	Specification
Output	27W maximum
AC input voltage	100 to 240 VAC[1]
AC input current	0.2 to 0.4A
Frequency	50 to 60 Hz
Operating temperature range	All models: –32 to 104 F (0 to 40 C)
Nonoperating temperature range	All models: –4 to 149 F (–20 to 65 C)
Operating humidity	All models: 10 to 85% noncondensing and operating, 5 to 95%, noncondensing and not operating

1. VAC = volts alternating current.

Table 3-8 Dimensions and Weight Specifications

	Cisco 1600 Series	WAN Interface Cards
Width	11.15 in. (28.32cm)	3.1 in. (7.9 cm)
Height	2.19 in. (5.56 cm)	0.8 in. (2.1 cm)
Depth	8.67 in. (22.02 cm)	4.8 in. (12.2 cm)
Weight (minimum)	1.65 lb. (0.75 kg)	0.13 lb (57 g)
Weight (maximum)	1.80 lb. (0.82 kg)	0.19 lbs (85 g)

Table 3-9 Cisco 1600 Series Router Models

Model	LAN Interface	Fixed WAN Interface	WAN Interface Cards Supported
Cisco 1601	10BaseT (RJ-45), AUI (DB-15)	Serial interface (DB-60),[1] which supports asynchronous analog connections up to 115.2 kbps, and synchronous connections, such as digital leased lines, Frame Relay, switched-56, SMDS, and X.25, up to 2.048 Mbps.	Serial,[1]synchronous, and asynchronous ISDN BRI S/T ISDN BRI U
Cisco 1602	10BaseT (RJ-45), AUI (DB-15)	Synchronous serial with integrated 56 kbps, four-wire CSU/DSU interface (RJ-48S), which supports permanent and switched 56 kbps and dataphone digital service (DDS) connections.	Serial, synchronous, and asynchronous ISDN BRI S/T ISDN BRI U
Cisco 1603	10BaseT (RJ-45), AUI (DB-15)	ISDN BRI with an S/T interface (RJ-45), which supports one ISDN BRI connection. (An ISDN BRI connection consists of two 64-kbps B channels and one 16-kbps D channel.)	Serial, synchronous, and asynchronous
Cisco 1604	10BaseT (RJ-45) AUI (DB-15)	ISDN BRI U interface (RJ-45) with an integrated NT1, one ISDN S-bus port (RJ-45), which supports one additional ISDN nondata device (such as an ISDN telephone or fax) on the same ISDN line as the router.	Serial, synchronous, and asynchronous
Cisco 1605-R	10BaseT (RJ-45) AUI (DB-15)	ISDN BRI U interface (RJ-45) with an integrated NT1, one ISDN S-bus port (RJ-45), which supports one additional ISDN nondata device (such as an ISDN telephone or fax) on the same ISDN line as the router. Integrated WAN interface.	Serial, synchronous, and asynchronous

1. Supports EIA/TIA-232, V.35, X.21, EIA/TIA-499, and EIA-530.

Cisco ConfigMaker Specifications

Cisco ConfigMaker is a wizards-based software tool that helps you to quickly and easily configure and address the Cisco 1000, 1600, 2500, and 3600 products. The Cisco ConfigMaker CD-ROM ships in the software feature pack for these products, or it can be downloaded from the following URL:

Table 3-4 contains the specifications for ConfigMaker.

Table 3-10 Cisco ConfigMaker Specifications

Description	Minimum Requirements
Operating system	Windows 95 or Windws NT 4.0
Processor	Pentium or equivalent 486 computer
Hard disk space	12 MB
RAM	16 MB
Monitor	SVGA with 640 x 460 pixels, 256 colors
Drives	CD-ROM

Cisco 2500 Series

This section contains the physical specifications and external connection requirements for the Cisco 2500 series. The specifications apply to the following Cisco 2500 series models:

- Single LAN routers: Cisco 2501, 2502, 2503, 2504, 2520, 2521, 2522, and 2523
- Mission-specific, entry-level routers: Cisco 2501CF, 2502CF, 2503I, 2504I, 2520CF, 2520LF, 2521CF, 2521LF, 2522CF, 2522LF, 2523CF, and 2523LF
- Router/hub combinations: Cisco 2505, 2507, 2516, 2517, 2518, and 2519
- Access servers:Cisco 2509, 2510, 2511, 2512
- Dual LAN routers: Cisco 2513, 2514, and 2515
- Modular routers: Cisco 2524 and 2525

Physical Specifications

Table 3-11 lists the physical specifications for Cisco 2500 series.

Table 3-11 Cisco 2500 Series Physical Specifications

Description	Specification
Dimensions (H x W x D)	Models 2501 to 2516 and 2520 to 2525—1.75 x 17.5 x 10.56 in (4.44 x 44.45 x 26.82 cm) Models 2517 to 2519—3.0 x 19.0 in (7.62 x 48.26 cm)
Weight (average shipping)	Models 2501 to 2516 and 2520 to 2525—10 lb (4.5 kg) Models 2517 to 2519—12.5 lb (5.7 kg)
Power consumption	For models 2501 to 2525—40W
Input voltage and frequency, AC power supply	For models 2501 to 2516 and 2520 to 2525—110 to 220 VAC, 50 to 60 Hz For models 2517 to 2519—90 to 260 VAC, 47 to 63 Hz
Input voltage, DC power supply	40 to 72 VDC
Current rating	For models 2501 to 2516 and 2520 to 2525—1.0A at 60 Hz, 0.5A at 50 Hz For models 2517 to 2519—5.0A at 60 Hz, 3.5A at 50 Hz
Operating temperature range	For models 2501 to 2516 and 2520 to 2525—32 to 104 F (0 to 40 C) For models 2517 to 2519—50 to 95 F (10 to 35 C)
Nonoperating temperature range	For models 2501 to 2516 and 2520 to 2525— – 40 to 185 F (– 40 to 85 C) For models 2517 to 2519— – 4 to 185 F (– 20 to 85 C)
Humidity (noncondensing)	For models 2501 to 2525—5 to 95%
Noise level	34 dBa @ 3 ft (0.914 m)

External Connections for Fixed-Configuration Models

This section contains the external connection requirements for the Cisco 2500 series. The interfaces available for Cisco 2500 series products vary from model to model.

- Asynchronous serial console and auxiliary ports with RJ-45 connectors.
- Synchronous serial interface with a DB-60 connector. The synchronous serial interface supports the following standards in DTE and DCE mode: EIA/TIA-232, EIA/TIA-449, V.35, and X.21. The EIA-530 standard is supported in DTE only.
- Ethernet attachment unit interface (AUI) IEEE 802.3 with a DB-15 connector or 10BaseT with an RJ-45 connector.
- Token Ring IEEE 802.5 interface with a DB-9 connector or RJ-45 connector.
- ISDN BRI interface with an RJ-45 connector.
- UTP hub ports with RJ-45 connectors.
- The Cisco 2500 series chassis can be mounted in a 19-inch or 24-inch rack, on a wall, or placed on a desktop.

External Connections for Cisco 2524 and 2525 Modular Routers

Only two Cisco 2500 series models include removable WAN modules: the Cisco 2524 and the Cisco 2525. The Cisco 2524 and Cisco 2525 routers provide LAN and WAN access in a modular router platform. The Cisco 2524 router includes an Ethernet (AUI or 10BaseT) LAN connection, and the Cisco 2525 router includes a Token Ring (STP or UTP) LAN connection. Both routers can accommodate up to three WAN modules: two synchronous serial and one ISDN.

The ISDN WAN modules are keyed so that you cannot insert them into the synchronous serial WAN slots. A blank slot cover is installed over unused slots to ensure proper air flow inside the chassis.

The synchronous serial WAN modules include the following external connectors:

- 2-wire switched 56-kbps digital service unit/channel service unit (DSU/CSU) WAN module with an RJ-11 connector.
- 4-wire 56/64-kbps DSU/CSU WAN module with an RJ-48S connector.
- Fractional T1/T1 DSU/CSU WAN module with an RJ-48C connector.
- 5-in-1 synchronous serial WAN module with a DB-60 serial connector. The five-in-one synchronous serial interface supports the following signaling standards: EIA/TIA-232, EIA/TIA-449, V.35, X.21, and EIA-530.
- The ISDN WAN modules include the following external connectors:
- ISDN BRI WAN module with an RJ-45 connector
- ISDN WAN module, with integrated NT1 device, with an RJ-45 connector

Cisco ConfigMaker Specifications

Cisco ConfigMaker is a wizards-based software tool that helps you to quickly and easily configure and address the Cisco 1000, 1600, 2500, and 3600 products. The Cisco ConfigMaker CD-ROM ships in the software feature pack for these products, or it can be downloaded from the following URL:

Table 3-4 contains the specifications for ConfigMaker.

Table 3-12 Cisco ConfigMaker Specifications

Description	Minimum Requirements
Operating system	Windows 95 or Windws NT 4.0
Processor	Pentium or equivalent 486 computer
Hard disk space	12 MB
RAM	16 MB
Monitor	SVGA with 640 x 460 pixels, 256 colors
Drives	CD-ROM

Cisco 3600 Series

This section contains the physical specifications and the external connection requirements for the Cisco 3600 series, which includes the Cisco 3620 and the Cisco 3640.

Physical Specifications

Table 19 contains the physical specifications for the Cisco 3600 series products.

Table 3-13 Cisco 3600 Series Physical Specifications

Description	Specification
Input voltage, AC power supply	100 to 240 VAC, autoranging
Current	Cisco 3640: 2.0A; Cisco 3620: 1.0A
Frequency	50 to 60 Hz
Power dissipation	Cisco 3640: 140W (maximum); Cisco 3620: 60W
Input voltage, AC power supply	38 to 72 VDC
Current	Cisco 3640: 5.0A; Cisco 3620: 2.5A
Power dissipation	Cisco 3640: 140W (maximum); Cisco 3620: 60W
Operating humidity	5 to 95%, noncondensing
Operating temperature range	32 to 104 F (0 to 40 C)
Nonoperating temperature range	–40 to 185 F (–40 to 85 C)
Regulatory compliance	FCC Part 15 Class B. For additional compliance information, refer to the *3600 Series Public Network Certification* document.

External Connections

This section contains external connection requirements for the Cisco 3600 series.

The Cisco 3620 and Cisco 3640 provide the same electrical interface types and modes; however, the Cisco 3620 is a two-slot modular access router, while the Cisco 3640 is a four-slot modular access router. Both routers allow identical LAN and WAN connections that can be configured by means of interchangeable network modules and WAN interface cards.

The Cisco 3620 and Cisco 3640 have the following external connection requirements, depending on the interface modules ordered:

- The EIA/TIA-232 console port is configured as DTE and uses an RJ-45 connector

  The router ships with a cable kit to connect a console (an ASCII terminal or PC running terminal emulation software) to the console port. The console cable kit contains an RJ-45-to-RJ-45 rollover cable and RJ-45-to-DB-9 and RJ-45-to-DB-25 female DTE adapters (labeled Terminal).

  Synchronous serial interface types, except EIA-530, are available in DTE or DCE format: DTE with a plug connector at the network end and DCE with a receptacle at the network end. V.35 is available in either mode with either gender at the network end. EIA-530 is available in DTE only.

Note The serial WAN interface card uses a universal high-density, 60-pin receptacle. Each universal port requires a serial port adapter cable that determines the port's electrical interface type (EIA/TIA-232, EIA/TIA-449, V.35, X.21) and mode: DTE or DCE. Although all port adapter cables use a universal plug at the quad serial module end, the network end of each cable type uses the physical connectors commonly used for the interface. (For example, the network end of the EIA/TIA-232 port adapter cable is a DB-25 connector, the most widely used EIA/TIA-232 connector.)

- IEEE 802.3 Ethernet attachment unit interface (AUI) using a DB-15 connector
- IEEE 802.3 Ethernet 10BaseT using an RJ-45 connector
- Unshielded twisted-pair (UTP) and shielded twisted-pair (STP), IEEE 802.5 Token Ring using DB-9 connectors
- Basic Rate Interface (BRI) using RJ-45 connectors; the Network Termination 1 (NT1) circuitry is included in the router

Caution To prevent damage to the system, make certain you connect the BRI cable to the BRI connector *only* and not to any other RJ-45 connector.

- Channelized E1/Primary Rate Interface (PRI)
- Cisco Systems makes four cables for the CE1/PRI modules. All four have DB-15 connectors on the CE1/PRI end and either BNC, DB-15, Twinax, or RJ-45 connectors on the network end.
- Channelized T1/PRI (on the CT1/PRI module only) using DB-15 connectors (for null-modem and straight-through cabling)
- Channelized T1/PRI-CSU (on the CT1/PRI-CSU module only) using a straight-through RJ-48C-to-RJ-48C cable to connect the T1 port to an RJ-48C jack

Cisco ConfigMaker Specifications

Cisco ConfigMaker is a wizards-based software tool that helps you to quickly and easily configure and address the Cisco 1000, 1600, 2500, and 3600 products. The Cisco ConfigMaker CD-ROM ships in the software feature pack for these products, or it can be downloaded from the following URL:

Table 3-4 contains the specifications for ConfigMaker.

Table 3-14 Cisco ConfigMaker Specifications

Description	Minimum Requirements
Operating system	Windows 95 or Windws NT 4.0
Processor	Pentium or equivalent 486 computer
Hard disk space	12 MB
RAM	16 MB
Monitor	SVGA with 640 x 460 pixels, 256 colors
Drives	CD-ROM

Cisco 4000 Series

Following are the physical specifications and external connection requirements for the Cisco 4000 series products, which include the Cisco 4000-M, the Cisco 4500-M, and the Cisco 4700-M.

Physical Specifications

Table 3-15 contains the physical specifications for the Cisco 4000 series products.

Table 3-15 Cisco 4000 Series Physical Specifications

Description	Specification
Dimensions (H x W x D)	3.4 x 17.6 x 17.7 in (8.6 x 44.7 x 43.4 cm)
Weight	24 lb (10.9 kg)
Power (heat) dissipation	200W (682.6 Btu/hr)
Input voltage, current, and frequency	100 to 240 VAC, 3.0 to 1.5A, 47to 63 Hz
Operating temperature	32 to 104 F (0 to 40 C)
Nonoperating temperature	– 40 to 185 F (– 40 to 85 C)
Humidity (noncondensing)	5 to 95%
Air flow and fan noise	Fan rated at 31 cfm, at 52 dBa
Agency approvals	UL 1950, CSA 22.2, TÜV-GS mark, EN 60950, FCC Class A, Canadian DOC Class A, VDE Class B, EN 55022 Class B, VCCI Class 2

External Connections

This section contains external connection requirements for the Cisco 4000 network processor modules, along with the other connections on the Cisco 4000 chassis.

Network Processor Modules

All Cisco 4000 series models provide a configurable modular router platform using network processor modules (NPMs), individual removable cards used for external network connections.

The Cisco 4000 series routers can support combinations of up to three of the following NPMs:

- 1-, 2-, or 6-port Ethernet

  Ethernet interface supported: IEEE 802.3 using attachment unit interface (AUI), DB-15 connectors, and 10BaseT using RJ-45 connectors.

- 1- or 2-port Token Ring

  Token Ring interfaces use DB-9 to IEEE 802.5, media attachment unit (MAU) connectors.

- 1-port, both single and dual attachment station (DAS), multimode FDDI

  The multimode network processor module connectors are FDDI-standard physical sublayer (PHY) connectors. The media interface connector (MIC) connects to FDDI standard 62.5/125 micron multimode fiber optic cable. The module also has an optical bypass switch connector using a 6-pin DIN connector.

- 1-port dual attachment single-mode FDDI

  The XMTR and RCVR ports use simplex, FC-type connectors.

- 2- or 4-port synchronous serial

  Serial interfaces supported by these modules: EIA-530, EIA/TIA-232, EIA/TIA-449, V.35, and X.21. All can be configured as nonreturn to zero inverted (NRZI), nonreturn to zero (NRZ), and DCE or DTE (except EIA-530, which is DTE only). Serial cables have DB-50 connectors for the two port module, and DB-60 connectors for the four port module.

- 4- or 8-port ISDN BRI

  Uses RJ-45 8-pin connectors.

- 1-port channelized T1/ISDN PRI

  Uses a 15-pin, DB-15 connector.

- 1-port channelized E1/ISDN PRI (balanced or unbalanced)

  Uses a 15-pin, DB-15 connector.

- 4-port serial G.703 (balanced or unbalanced)

  Uses 15-pin, DB-15 connectors.

- 1-port ATM (single-mode or multimode) OC-3c

  Uses a duplex SC connector.

- 1-port ATM DS-3

  Uses a duplex SC connector.

- 1-port ATM E3

Other External Connections

This section includes the other external connection requirements for Cisco 4000 series systems.

- The data communications equipment (DCE) console port uses a male DB-25 connection, and the data terminal equipment (DTE) auxiliary port uses a female DB-25 connection. (A standard EIA/TIA-232 cable can be used for either.)
- The Cisco 4000 series chassis can be optionally rack- (standard 19 inch and Telco), slide-, desk- (top or side), or wall-mounted.

Cisco AS5200 Universal Access Server

This section contains the physical specifications and external connection requirements of the Cisco AS5200 universal access server.

Physical Specifications

Table 3-16 lists the physical specifications for the AS5200 access server.

Table 3-16 Cisco AS5200 Universal Access Server Physical Specifications

Description	Specification
Dimensions (H x W x D)	3.5 x 17.5 x 15 in two rack units (8.89 x 44.45 x 38.1 cm)
Weight	25 lb (11.4 kg)
Input voltage, AC power supply Current frequency Power dissipation	100 to 240 VAC 1.0 to 2.0A50 to 60 Hz 180W (maximum), 135.5 Btus/hour
Input voltage, DC power supply Maximum input current Typical input current Power dissipation Output voltage	– 48 to – 60 VDC 6.0A 4.0A 180W (maximum) 5.0 VDC
Alarm relay rating Voltage Current Maximum switching power Maximum switching voltage	 48 VDC 3A 150W 220 VAC
Operating temperature	32 to 104 F (0 to 40 C)
Nonoperating temperature	– 40 to 185 F (– 40 to 85 C)
Operating humidity	5 to 95%, noncondensing
Noise level	34 dB @ 3 ft (0.914 m)

External Connections

The Cisco AS5200 access server has a 19-inch modular chassis that accommodates up to three feature cards. The feature cards should be a combination of one or two WAN cards and one or two modem carrier cards.

The types of cards and their external connection requirements are as follows:

- Dual T1 Primary Rate Interface (PRI) card with integrated channel service units (CSUs)

  The dual T1 PRI card routes incoming digital T1 lines to the modem modules. It uses RJ-48C connectors.

- Modem carrier card with MICA

  The Cisco AS5200 access server can contain up to 60 modem ports installed on two carrier cards in the chassis card slots. Each modem carrier card holds up to five, 6-port MICA modem modules. The modem cards connect through the carrier card and the system backplane to the dual T1 PRI card. Transmission or reception is then accomplished on T1 lines connected to the dual T1 PRI card.

  A serial connection to the modem can be made through the Ethernet attachment unit interface (AUI) port or the serial ports on the chassis.

  A blank slot cover is installed over any unused slots.

Other External Connections

Additional external connections for the Cisco AS5200 are as follows:

- Two serial WAN interface ports

  The serial ports on the Cisco AS5200 are five-in-one synchronous serial using 60-pin, D-type connectors. The interface supports EIA/TIA-232, EIA/TIA-449, V.35, X.21 (NRZ/NRZI and data terminal equipment (DTE)/DCE mode), and EIA-530 (NRZ/NRZI and DTE mode).

- One Ethernet LAN port using an AUI, DB-15 connector

- Console port

  An EIA/TIA-232 (RJ-45) console asynchronous serial port connects to a terminal using an RJ-45 cable and an RJ-45-to-DB-25 adapter or to a PC using an RJ-45 to DB-9 adapter.

- Auxiliary port

  An EIA/TIA-232 (RJ-45) auxiliary asynchronous serial port can connect to a modem for remote maintenance or other access services. The port uses an RJ-45 roll-over cable with a male modem (MMOD) adapter (labeled “Modem”) for this connection.

- Alarm port connections

  The three-pin alarm port is a future enhancement that will connect the Cisco AS5200 to an external audio, visual, or other alarm. The alarm port is not supported by current versions of the system software or the feature cards.

- Two Cisco AS5200 power supplies provide AC or DC power input and supply DC power to the installed cards via connectors in the backplane. Either the AC or DC power supply is required in the chassis.

Cisco 7500 Series

The following are the physical specifications and external connection requirements for the Cisco 7500 series.

Cisco 7505

This section includes the physical specifications and power supply requirements of the Cisco 7505.

Physical Specifications

Table 3-17 lists the physical specifications for the Cisco 7505.

Table 3-17 Cisco 7505 Physical Specifications

Description	Specification
High-speed backplane	5-slot, 1.067-Gbps CyBus: 4 interface processor slots plus the RSP slot
Dimensions (H x W x D)	10.5 x 17.5 x 17.0 in. (26.67 x 44.45 x 43.18 cm) Chassis depth including power cord and cable management fixture is 19 in (48.26 cm)
Weight	Chassis only (including power supply and fan array): 46 lb (20.87 kg) Chassis fully configured with RSP1 and 4 interface processors: 70 lb (31.75 kg)
Power dissipation	600W maximum configuration with AC-input power supply 600W maximum configuration with DC-input power supply 540W typical with maximum configuration
Heat dissipation	715W (2440 Btus/hr)
AC-input voltage	100 to 240 volts AC (VAC), wide input with power factor corrector (PFC)
Frequency	50 to 60 Hz
AC-input current	9A maximum @ 100 VAC 4A maximum @ 240 VAC at 600W
DC-input voltage	–40 volts DC (VDC) minimum in North America (–56 VDC in the Europe Community) –48 VDC nominal in North America (–60 VDC in the Europe Community) –52 VDC maximum in North America (–72 VDC in the Europe Community) 20A maximum at –48 VDC and 16A maximum @ –60 VDC
DC voltages supplied and maximum, steady-state current ratings for AC- and DC-input	+5.2 VDC @ 75 amps (A) +12 VDC @ 15A – 12 VDC @ 3A +24 VDC @ 5A
DC-input cable	8 AWG (American Wire Gauge); recommended minimum wire gauge
DC-input hold-up time	10 milliseconds (ms) of output after the DC input has been interrupted
Airflow	Side-to-side through chassis by variable-speed, 6-fan array
Operating temperature	32 to 104 F (0 to 40 C)
Nonoperating temperature	–4 to 149 F (–20 to 65 C)
Relative humidity	10 to 90%, noncondensing

Power Supply Requirements

The Cisco 7505 comes equipped with one 600W AC-input power supply or one 600W DC-input power supply. The AC-input power supply operates on AC-input power and supplies DC power to the internal components. The DC-input power supply operates on DC-input power and supplies DC power to the internal components.

The AC power receptacle (or DC-input terminal block), power on/off switch (or circuit breaker-type switch on the DC-input power supply), and status LED are on the interface processor end of the power supply. A modular power cable connects the AC-input power supply to the site AC power source. A cable retention clip on the power supply AC receptacle prevents the cable from being pulled out accidentally. The DC-input is supplied by a three-lead, 8-AWG cable that you provide.

Inside the AC-input or DC-input power supply, two small fans draw cooling air through the power supply interior. The air flows in one side of the supply and out the other side, following the same direction as the chassis cooling air.

Cisco 7507

This section includes the physical specifications and power supply requirements of the Cisco 7507.

Physical Specifications

Table 3-18 lists the physical specifications for the Cisco 7507.

Table 3-18 Cisco 7507 Physical Specifications

Description	Specifications
High-speed backplane	1.067-Gbps CyBus (the 7507 has dual CyBuses), 7 slots
Dimensions (H x W x D)	19.25 x 17.5 x 25.1 in. (48.90 x 44.45 x 63.75 cm) Chassis depth including power cable is 28 in (71.12 cm).
Weight	Chassis only: 76 lb (34.47 kg) Chassis fully configured with 2 RSP2s, 5 interface processors, and 2 power supplies: 145 lb (65.76 kg)
DC-input voltage	–40 volts direct current (VDC) minimum –48 VDC nominal –72 VDC maximum
DC voltages supplied and steady-state maximum current ratings	+5.2V @ 100 amps (A) +12V @ 15A –12V @ 3A +24V @ 5A
DC-input power	1000 watts (W)
DC-input power supply hold-up time specification	10 milliseconds (ms) of output after the input has been interrupted
DC-input wiring	8 AWG (American Wire Gauge) wire, which you provide
Power supply	700W maximum (AC-input and DC-input power supplies)
Power dissipation	626W maximum configuration, 530W typical with maximum configuration
Heat dissipation	1200W (4100 Btu/hr)
Input voltage	100 to 240 VAC wide input with power factor correction (PFC)
Frequency	50 to 60 Hz (hertz) autoranging

Table 3-18 Cisco 7507 Physical Specifications (Continued)

Description	Specifications
AC current rating	12A maximum at 100 VAC, 6A maximum at 240 VAC with the chassis fully configured
Airflow	140 cfm (cubic feet per minute) through the system blower
Operating temperature	32 to 104 F (0 to 40 C)
Nonoperating temperature	–4 to 149 F (–20 to 65 C)
Humidity	10 to 90%, noncondensing

Power Supply Requirements

The Cisco 7507 contains either one 700W AC-input power supply or one 700W DC-input power supply. An optional second power supply, identical to the first, can be added for redundant power. These power supplies are automatically load-sharing and redundant, which means a second power supply can be installed or replaced without interrupting system operation.

Each power supply should be connected to a separate AC or DC source, so that, in case of an input power line or power supply failure, the second power supply maintains uninterrupted system power. Ideally, an uninterruptible powers source (UPS) would be available for each AC-input power supply.

Cisco 7513

This section includes the physical specifications and power supply requirements of the Cisco 7513.

Physical Specifications

Table 3-18 lists the physical specifications for the Cisco 7513.

Table 3-19 Cisco 7513 Physical Specifications

Description	Specification
Backplane	13-slot, two 1.0677-Gbps CyBuses: 11 interface processor slots plus the two RSP2 slots
Dimensions (H x W x D)	33.75 x 17.5 x 22 in. (85.73 x 44.45 x 55.88 cm) Chassis width including rack-mount flanges is 18.93 in (48.1 cm) Chassis depth including power cord and cable management fixture is 24 in. (60.96 cm)
Weight	Chassis with blower module: 75 lb (34.02 kg) Chassis with blower module and 1 power supply: 100 lb (45.36 kg) Chassis with blower module and 2 power supplies: 125 lb (56.7 kg) Chassis with blower module, 2 power supplies, and all slots filled: 160 lb (72.58 kg) Each processor module weighs 2.5 lb (1.13 kg)
Power dissipation	1600W with a maximum configuration and one AC-input power supply 1600W with a maximum configuration and one DC-input power supply 1700W nominal with a maximum configuration and two AC- or DC-input power supplies
Heat dissipation	1600W (5461 Btu/hr)
AC-input voltage and current	100 VAC[1] at 16 amps (A) maximum[2] wide input with power factor correction (PFC) 240 VAC at 7A maximum

Table 3-19 Cisco 7513 Physical Specifications (Continued)

Description	Specification
Frequency	50/60 Hz
AC-input cable	12 AWG (American Wire Gauge), with three-leads, an IEC-320 receptacle on the power supply end, and a country-dependent plug on the power source end
DC-input voltage and current	–48 VDC[3] nominal, at 35 amps (A) in North America (–60 VDC at 35A in the E.C.)
DC-input cable	8 AWG recommended minimum, with three conductors rated for at least 194 F (90 C)
DC voltages supplied and maximum, steady-state current (AC- and DC-input)	+5.2 VDC @ 75 A +12 VDC @ 15A –12 VDC @ 3A +24 VDC @ 5A
Airflow and noise level	Through chassis by variable-speed blower; 62 to 70 dBA
Temperature	32 to 104 F (0 to 40 C), operating; – 4 to 149 F (– 20 to 65 C), nonoperating
Relative humidity	10 to 90%, noncondensing

1. VAC = volts alternating current.
2. Each AC-input power supply operating at 120 VAC requires a dedicated 20A service and a 20A receptacle.
3. VDC = volts direct current.

Power Supply Requirements

The Cisco 7513 contains either one 1200W AC-input power supply or one 1200W DC-input power supply. An optional second power supply, identical to the first, can be added for redundant power. These power supplies are automatically load sharing and redundant, which means a second power supply can be installed or replaced without interrupting system operation. Each power supply should be connected to a separate AC or DC source, so that, in case of an input power line or power supply failure, the second power supply maintains uninterrupted system power. Ideally, an uninterruptible power source (UPS) would be available for each AC-input power supply.

Special Power Requirements for the Cisco 7513

The Cisco 7513 requires that a 20-amp (A) service be available at your site.

Wiring codes prevent 20A plugs from being used with most equipment rack power strips. The installation must comply with all applicable codes. The ground bond fastening hardware should be of compatible material and preclude loosening, deterioration, and electro chemical corrosion of hardware and joined material. Installation is approved for use with copper conductors only. Attachment of the chassis ground receptacles to the central office or other interior ground system should be made with a Number 6 AWG copper ground conductor as a minimum.

The Cisco 7513 chassis employs two threaded, M4 x .7 chassis ground receptacles. These receptacles are intended to be bonded directly to the central office or other interior ground system, and are located on each side of the rear of the chassis. The chassis ground receptacles require M4 bolts and locking hardware, which are not included.

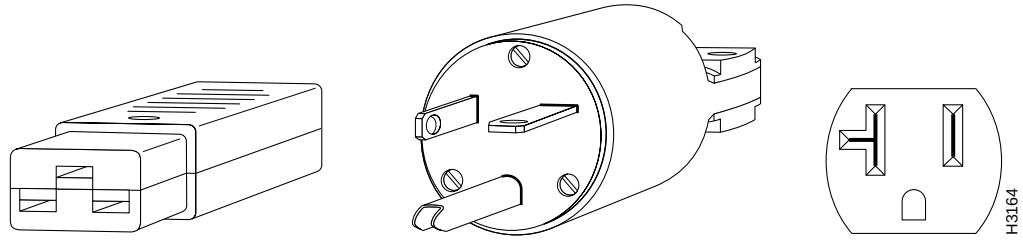
Follow these precautions and recommendations when planning power connections to the router:

- Check the power at your site before installation and periodically after installation to ensure that you are receiving clean power. Install a power conditioner if necessary.
- Provide redundant power sources for each power supply installed in the chassis.

- For AC-input installations, install an uninterruptible power source where possible.
- Install proper grounding to avoid damage from lightning and power surges.
- For both AC-input and DC-input installations, observe the power specifications listed in Table 3-18.

The AC-input-powered chassis operating at 120 VAC requires, at the minimum, a 20-amp service, with a 20-amp receptacle at the power source. The power cable supplied with the chassis uses a 20-amp plug. Figure 3-1 shows the cable features needed to connect the 20-amp plug to your AC source.

Figure 3-1 20-A AC Power Cable Connector, Plug, and 20-amp Receptacle

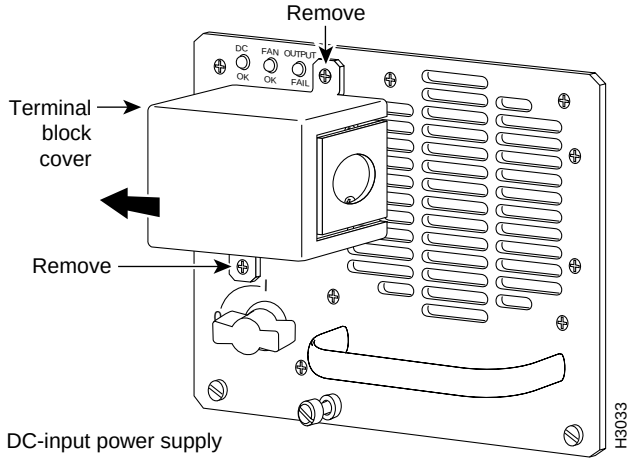


IEC 320 20-amp connector (to the AC power supply) | 20-amp plug | 20-amp receptacle

Note Wiring codes prevent 20A plugs from being used with most equipment rack power strips.

The DC powered chassis requires a minimum 35A dedicated service (at – 48VDC). We recommend that you use an 8 AWG, highly flexible, stranded cable for the DC power connections. The stranded cable should be routed through conduit at your site, and the conduit should attach to the terminal block cover on the power supply. (See Figure 3-2.)

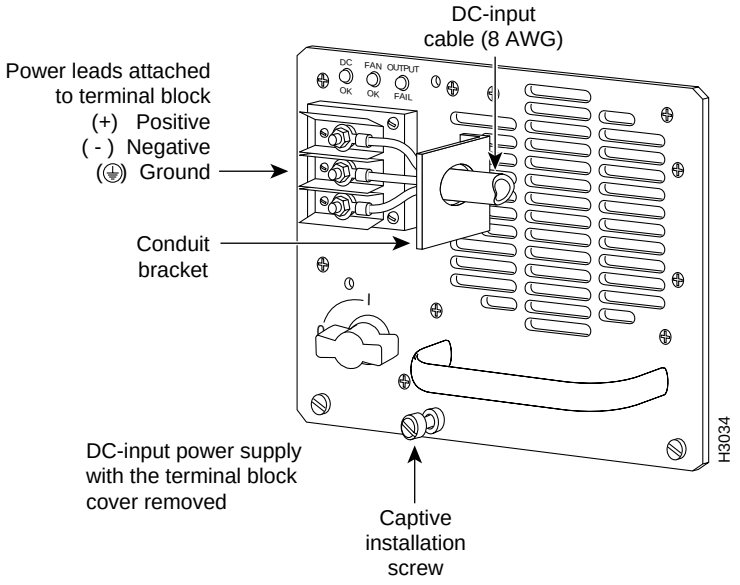
Figure 3-2 Terminal Block Cover



DC-input power supply

Figure 3-3 shows the conductor preparation for the DC-input cable connections.

Figure 3-3 DC Power Cable Connection to Terminal Block



Cisco 7500 Series External Connections

This section lists the external connection requirements for the Cisco 7500 series.

- Asynchronous Transfer Mode (ATM) Interface Processor (AIP)

  All AIP interfaces are full duplex. Use the appropriate ATM interface cable to connect the AIP to an external ATM network.

  The AIP supports the following interface connectors:

  — Transparent Asynchronous Transmitter/Receiver Interface (TAXI) multimode fiber optic using a MIC connector

  — SONET/SDH using simplex or duplex SC connectors

  — SONET/SDH using ST2 connectors

  — E3 using a coaxial BNC connector

  — DS3 using a coaxial BNC connector

- Ethernet Interface Processor (EIP)

  Each Ethernet port on the EIP requires a connection to an Ethernet transceiver with a transceiver cable, or to an attachment unit with an AUI. Some Ethernet transceivers, usually 10BaseT, can connect directly to the EIP port.

- Fast Ethernet Interface Processor (FEIP)

  — The MII port can be connected to your network directly with an MII cable, or can be connected through a 100BaseT or 100BaseF transceiver.

  — RJ-45 ports do *not* require a transceiver.

Note A single 100BaseT port adapter can use either the RJ-45 (or optical fiber) connection or the MII connection. If you have two port adapters on your FEIP, you can use either one of the two connections on each port adapter, but not both connections on each port adapter simultaneously.

- Token Ring Interface Processor (TRIP)

  Token Ring MAU connectors provide a direct connection between the TRIP and the ring.

- Fiber Distributed Data Interface (FDDI) Interface Processor (FIP)

  Both single-mode and multimode, single and dual attachment connections are available and can be combined on one FIP. Fiber optic cable connects directly to FIP ports using SC connectors for single mode and MIC connectors for multimode. Single-mode uses separate transmit and receive cables. Multimode uses one transmit/receive cable for each physical sublayer (PHY) interface.

- Optical bypass switch connector (6-pin DIN) on the Multimode/Multimode interface.

- Fast Serial Interface Processor (FSIP)

  All FSIP ports support any available interface type and mode. The serial adapter cable determines the electrical interface type and mode of the port to which it is connected. E1-G.703/G.704, EIA/TIA-232, EIA/TIA-449, V.35, and X.21 interfaces are available in data terminal equipment (DTE) mode with a plug at the network end and in DCE mode with a receptacle at the network end. EIA-530 is available only in DTE mode with a plug.

- High-Speed Serial Interface (HSSI) Interface Processor (HIP)

  The HIP port functions as a DTE when it is connected to a DSU for a standard HSSI connection; it can also be connected to a collocated router with a null-modem cable. Connecting the router to an HSSI network uses an HSSI interface cable between the HIP port and the DSU. HSSI cable ends are identical.

- Channel Interface Processor (CIP)

  The CIP has two channel adaptors, a bus and tag adapter and an ESCON adapter. The bus and tag adapter is called a Parallel Channel Adapter (PCA), and the ESCON adapter is called an ESCON Channel Adapter (ECA). The PCA uses 78-pin connectors for a Y cable. The ECA uses a fiber optic ESCON cable with duplex connectors.

- Multichannel Interface Processor (MIP)

  Two standard T1 serial cables can be used to connect the MIP: null-modem and straight-through. These interface cables are used to connect your MIPs to additional MIPs or to external CSUs, respectively.

  You must use null-modem cables for MIP-to-MIP connections and straight-through cables for MIP-to-CSU connections. The T1 cables used to connect the MIP with external T1 equipment have DB-15 male connectors on each end.

  Four types of E1 cable can be used to connect the MIP: BNC, Twinax, DB-15, and RJ-45. The E1 cables used to connect the MIP with external E1 equipment have a DB-15 male connector on the MIP end.

- Second-Generation Versatile Interface Processor (VIP2)

  The VIP2 uses port adapters that provide the following electrical interfaces: synchronous serial using EIA/TIA-232, EIA/TIA-449, V.35, and X.21 DTE and DCE cables, and EIA-530 DTE cables only; IEEE 802.5 Token Ring using RJ-45; IEEE 802.3 Ethernet 10BaseT using RJ-45; IEEE 802.3 Ethernet 10BaseFL using ST-type multimode, optical fiber; IEEE 802.3u Fast Ethernet 100BaseTX and 100BaseFX using MII and RJ-45 or MII and SC-type optical fiber; and single-mode and multimode FDDI using MIC and SC-type optical fiber.

- The data communications equipment (DCE) console port uses a male DB-25 connection, and the data terminal equipment (DTE) auxiliary port uses a female DB-25 connection. (A standard EIA/TIA-232 cable can be used for either.)

Cisco 7500 Series Rack-Mount Requirements

The Cisco 7500 series operates as either a freestanding or rack-mounted unit. An optional rack-mount kit is available for mounting the chassis in an EIA-310C standard 19-inch equipment rack or in a Telco-type rack. When the system is not mounted in a rack, place it on the floor or on a sturdy platform. Do not stack the chassis on other Cisco 7500 series, or any other equipment.

Note For specific rack-mount information, refer to the documentation that ships with the rack-mount kit.

Cisco 7200 Series

Following are the physical specifications and external connection requirements for the Cisco 7200 series. The Cisco 7200 series includes the Cisco 7204 and Cisco 7206 routers.

Physical Specifications

Table 33 lists the physical specifications for the Cisco 7204 and the Cisco 7206 routers.

Table 3-20 Physical Specifications

Description	Specification
Dimensions (H x W x D)	5.25 in. x 16.8 in. x 17 in. (13.34 cm x 42.67 cm x 43.18 cm)
Weight	Chassis fully configured with a network processing engine, I/O controller, 6 port adapters, 2 power supplies, and a fan tray: ~ 50 lb (22.7 kg)
Heat dissipation	370W (1262 Btu[1])
AC-input power	370W maximum (with either a single or dual power supply configuration)
AC-input voltage rating	100-240 VAC[2] wide input with power factor correction
AC-input current rating	Not to exceed 5A[3] max at 100 VAC and 2.5A max at 240 VAC with chassis fully configured
AC-input frequency rating	50/60 Hz[4]
AC-input cable	18 AWG[5] three-wire cable, with a three-lead IEC-320 receptacle on the power supply end, and a country-dependent plug on the power source end
DC-output power	280W maximum (with either a single or dual power supply configuration)
DC-input power	370W maximum (with either a single or dual power supply configuration)
DC-input voltage rating	–48 VDC[6] nominal in North America –60 VDC nominal in the Europe Community
DC-input current rating	Not to exceed 13A maximum at –48 VDC (370W/–48 VDC = 7.7A typical draw) Not to exceed 8A maximum at –60 VDC (370W/–60 VDC = 6.2A typical draw)
DC voltages supplied and maximum, steady-state current ratings	+5.2V @ 30A +12.2V @ 9A –12.0V @ 1.5A +3.5V @ 13A
DC-input cable	14 AWG (2.08 mm) recommended minimum, with at least three conductors rated for at least 140 F (60 C)
Airflow	~80 cfm[7]
Temperature	32 to 104 F (0 to 40 C) operating; -4 to 149 F (-20 to 65 C) nonoperating
Humidity	10 to 90% noncondensing
Agency approvals	Safety: UL 1950, CSA 22.2 No. 950, EN60950, AUSTEL TS001, AS/NZS 3260, IEC 950 EMI: FCC Class A, CSA Class A, EN60555-2, EN55022 Class B, VCCI Class 2, AS/NRZ 3548 Class A Immunity: IEC-1000-4-2, IEC-1000-4-3, IEC-1000-4-4, IEC-1000-4-5, IEC-1000-4-6, IEC-1000-4-11, IEC 1000-3-2

1. Btu = British thermal units.
2. VAC = volts alternating current.
3. A = ampere.
4. Hz = hertz.
5. AWG = American Wire Gauge.
6. VDC = volts direct current.
7. cfm = cubic feet per minute.

External Connections

This section contains the external connection requirements for the Cisco 7204 and Cisco 7206 routers.

- Input/Output Controller (I/O controller)
  - The I/O controller has two EIA/TIA-232 ports: a DCE-mode console port and a DTE-mode auxiliary port. The console port is a DCE DB-25 receptacle for connecting a data terminal, which you will use to configure the interfaces and bring up the router.
  - The auxiliary port is a DTE DB-25 plug for connecting a modem or other DCE device (such as a CSU/DSU or other router) to the router. A standard EIA/TIA-232 cable can be used for the auxiliary and console ports.
  - The MII connector supports IEEE 802.3u interfaces compliant with the 100BaseX and 100BaseT standards. The single MII connection requires an external transceiver that permits connection to multimode fiber for 100BASE-FX or 100BaseT4 physical media.
- Port adapters

  The Cisco 7204 and the Cisco 7206 routers use port adapters that provide the following electrical interfaces:
  - Synchronous serial using EIA/TIA-232, EIA/TIA-449, V.35, and X.21 DTE and DCE cables, and EIA-530 DTE cables only
  - IEEE 802.5 Token Ring using RJ-45 connections
  - IEEE 802.3 Ethernet 10BaseT using RJ-45 connections
  - IEEE 802.3 Ethernet 10BaseFL using ST-type multimode, optical fiber connections
  - IEEE 802.3u Fast Ethernet 100BaseTX and 100BaseFX using MII and RJ-45 or MII and SC-type optical fiber connections
  - Single-mode and multimode FDDI using MIC and SC-type optical fiber connections

Cisco LightStream 1010

This section contains the physical specifications and external connection requirements for the LightStream 1010 ATM switch.

Physical Specifications

Table 3-21 lists the physical specifications for the Cisco LightStream 1010.

Table 3-21 Cisco LightStream 1010 Physical Specifications

Specification	Description
Dimensions (H x W x D)	Chassis: 10.5 x 17.2 x 18.1 in. (26.7 x 43.7 x 46.1 cm); standard 19-inch rack mount ASP[1] and CAM: 1.2 x 14.4 x 16.0 in. (3.0 x 36.6 x 40.6 cm) PAM[2]: 1.2 x 6.5 x 10 in. (3.0 x 16.5 x 25.4 cm)
Weight	Empty: 43 lb (19.5 kg) Fully loaded: approximately 85 lb (39 kg) (depends on loading)
Power supply	Maximum power budget: 9.8A @ 115 VAC, 60 Hz 4.9A @ 230 VAC, 50 Hz Auto sensing limits: 100-127/200-240 VAC, 8/4A, 47-63 Hz Maximum wattage: 376 watts (W)
Altitude	– 500 ft to 10,000 ft (– 52 m to 3,048 m)
Temperature	32 F to 104 F (0 C to 40 C)
Relative humidity	10 to 90% noncondensing
Safety certifications	UL 1950 EN 60950 CSA-C22.2 No. 950-93 Electromagnetic emissions certifications FCC Class A (Part 15) EN 55022 Class B CE Mark VCCI Class II

1. ASP = ATM Switch Processor.
2. PAM = Port adapter module.

External Connections

The LightStream 1010 uses a five-slot chassis with an ATM backplane and fan tray. It has the following external connection requirements:

- ATM Switch Processor (ASP)
  - — Console and Auxiliary (AUX) serial port

    Two asynchronous EIA/TIA-232 serial ports on the ASP, the console and auxiliary ports, provide the means for connecting a terminal, modem, or other device for configuring and managing the system. A data communications equipment (DCE) EIA/TIA-232 (female connector) receptacle console port on the ASP provides a direct connection for a console terminal.

    The adjacent data terminal equipment (DTE) EIA/TIA-232 (male connector) plug auxiliary port supports flow control and is often used to connect a modem, a channel service unit (CSU), or other optional equipment for Telnet management of the attached device.

— Ethernet port

The Ethernet management RJ-45 port can be used to connect a management workstation and enables SNMP management of the LightStream 1010 switch.

- Feature card

The feature card is a daughter card of the ASP module and implements a number of value-add capabilities over and above the base switch mechanisms.

- Port adapter module carrier

The port adapter module carrier (CAM) can be installed in any slot, except slot number 2, in the LightStream 1010 and allows any combination of port adapter modules (PAMs) to be installed with a maximum of two PAMs per CAM. Port adapters are numbered 0 and 1, with 0 on the left, facing the rear of the switch.

— 155-MM port adapter module

Provides connections for four multimode fiber optic interfaces using four duplex SC connectors.

— 155-SM port adapter module

Provides connections for four single-mode fiber optic interfaces using SC connectors.

— 155-UTP port adapter module

Provides connections to four UTP interfaces using RJ-45 connectors.

— DS-3 port adapter module

Provides connections to two DS-3 interfaces using BNC coaxial connectors.

— E3 port adapter module

Provides connections to two E3 interfaces using BNC coaxial connectors.

— 622-SM port adapter module

Provides a connection to an OC12 interface using a duplex SC, single-mode, fiber optic connector.

— System backplane

The high-speed backplane operates at 5 Gbps. The backplane provides the connection between the power supplies, the ASP, the port adapter modules, and the backbone. The backplane slots are numbered 0 through 4, with 0 at the top of the card cage and 4 at the bottom.

Power Supply Requirements

The LightStream 1010 ATM switch comes equipped with one 350W AC-input power supply. An optional second power supply, identical to the first, can be added for redundant power. Dual power supplies are automatically load sharing and redundant, which means that a second power supply can be installed or replaced without interrupting system operation.

When two power supplies are installed and both are turned on, each concurrently provides about half of the required power to the system. If one of the power supplies fails, the second power supply immediately ramps up to full power to maintain uninterrupted system operation. Load sharing and fault tolerance are automatically enabled when the second power supply is installed; no software configuration is required.

Each power supply can be connected to a separate AC source so that, in case of an input power line or power supply failure, the second power supply maintains uninterrupted system power.

Ventilation Requirements

The field-replaceable system fan assembly provides cooling air for the ASP, interface modules, and backplane. The fan assembly is located inside the chassis.

An internal fan in each power supply draws cooling air from the front of the chassis through the power supply and out the rear of the chassis. An air dam keeps the power-supply airflow separate from that of the rest of the chassis, which is cooled by the fan assembly.

When you are facing the front of the chassis, the fan assembly draws cool air from the right side of the chassis to cool the modules. The exhaust air is forced out the left side of the chassis.

Sensors on the ASP monitor the internal chassis air temperatures. If the air temperature at the sensor exceeds a desired threshold, the environmental monitor displays warning messages.

Catalyst 1900(r)

This section contains the physical specifications and external connection requirements for the Catalyst 1900 Ethernet desktop switch.

Physical Specifications

Table 3-22 lists the physical specifications for the Catalyst 1900 switch.

Table 3-22 Catalyst 1900 Physical Specifications

Characteristic	Description
Operating temperature	32–104˚F (0–40˚C)
Operating humidity	10% to 90%
Operating altitude	Up to 10,000 feet
Power consumption	65 watts (W)
Input voltage	90 to 250 V @ 50 to 60 Hz
Reliability	50,000 hours MTBF
Weight	7 lb. (3.2 kg)
Dimensions (H x W x D)	1.73 x 17.5 x 8.25 in. (4.39 x 44.45 x 2 cm)

External Connections

This section contains the external connection requirements for the Catalyst 1900.

- A 9-pin, male management port that functions as a DTE port. This port enables attachment of a console terminal or terminal emulator that is used to customize the switch's configuration, monitor switch activity and status, and test the switch. Console access can be either local, by direct attachment to the EIA/TIA-232 port, or remote, through a modem connection. The EIA/TIA-232 port automatically detects the baud rate of the terminal to which it is attached.
- 25 switched Ethernet ports: 24 10BaseT and one AUI

  The 10BaseT ports use RJ-45 connectors to connect to single workstations, 10BaseT hubs, or any 10BaseT compatible device. The attached devices use standard 10BaseT adapters and wiring. Port 25, located on the back panel, supports an alternative AUI connection using a DB-15 connection for attachment to a thick coaxial, thin coaxial, or a fiber optic media transceiver.
- Two fixed 100BaseT ports using RJ-45 connections

  Each 100BaseT port is internally switched to the other Catalyst 1900 ports. One or both of these can be set to collision-free full-duplex mode for full-duplex operation.
- 10 Mbps ports:
  - RJ-45 Connectors
  - Two-pair Category 3, 4, or 5 UTP cabling
  - DB15 connector on AUI port

- 100BaseTX ports:
  - RJ-45 connectors
  - Two-pair Category 5 UTP cabling
- 100BaseFX ports:
  - SC connector, 50/125- and 62.5/125-micron multimode fiber-optic cabling
- Management console port
  - RJ-45 connector
- Rack mount kit included

Catalyst 2820

This section contains the physical specifications and external connection requirements for the Catalyst 2820.

Physical Specifications

Table 45 lists the physical specifications for the Catalyst 2820.

Table 3-23 Catalyst 2820 Physical Specifications

Description	Specification
Dimensions (H x W x D)	3.34 x 17.5 x 12.4 in. (8.76 x 44.45 x 31.5 cm)
Weight	13 lbs (5.90 kg)
Reliability	50,000 hours MTBF
Power consumption	110 watts (W)
Operating altitude	Up to 10,000 ft
Operating temperature	32–104˚F (0–40˚C)
Operating humidity	10% to 90%
Input voltage	90 to 250 V @ 50 to 60 Hz

External Connections

Following are the external connection requirements for Catalyst 2820.

- This 9-pin, male, management port functions as a DTE port. This port enables attachment of a terminal or terminal emulator that is used to customize the switch's configuration, monitor switch activity and status, and test the switch. Console access can be either local, by direct attachment to the EIA/TIA-232 port, or remote, through a modem connection. The EIA/TIA-232 port automatically detects the baud rate of the terminal to which it is attached.
- 25 switched Ethernet ports: 24 10BaseT using RJ-45 connections and one AUI using a DB-15 connection.

  The Ethernet 10BaseT ports can connect to single workstations, 10BaseT hubs, or any 10BaseT compatible device. The attached devices use standard 10BaseT adapters and wiring. Port 25, located on the back panel, supports an alternative Ethernet AUI connection for attachment to a thick coaxial, thin coaxial, or a fiber optic media transceiver.
- 10 Mbps ports:
  - RJ-45 Connectors
  - Two-pair Category 3, 4, or 5 UTP cabling
  - DB15 connector on AUI port
- 100BaseTX ports:
  - RJ-45 connectors
  - Two-pair Category 5 UTP cabling

- 100BaseFX ports:
  - SC connector, 50/125- and 62.5/125-micron multimode fiber-optic cabling
- Management console port
  - RJ-45 connector
- Two high-speed expansion slots supporting the following:
  - 100BaseT
  - FDDI
  - ATM 155 Single Mode OC-3 Fiber modules a medium-reach version (SM-MR) and a long-reach version (SM-LR) with one SC fiber-optic connector
  - ATM 155 Multi Mode OC-3 Fiber module with one SC fiber-optic connector
  - ATM 155 Multi Mode Fiber module with one SC fiber-optic cable

  The high-speed expansion slots are compatible with Catalyst 2820 field-replaceable modules and provide high-bandwidth connections to backbones, servers, and other high-performance devices. Each expansion slot is internally switched to all other Catalyst 2820 ports.
  - 100BaseTX module: uses unshielded twisted-pair (UTP) cable
  - 100BaseFX module: uses single-mode, SC-type, optical fiber
  - FDDI module: dual attachment station (DAS) and single attachment station (SAS), uses multimode optical fiber cable (with MICs)
  - CDDI module: SAS, uses Category 5 UTP cable

  The maximum distance for multimode fiber-optic network connections is two kilometers. Each ATM module complies with the following standards:
  - LANE 1.0 for LANE client only
  - Synchronous Optical Network (SONET) and Synchronous Transport Signal level 3 (STS-3c) physical layer.
  - SONET Digital Heirarchy (SDH) STM-1
- Rack mount kit included

Catalyst 3000

The following sections describe the physical specifications and external connection requirements for the Catalyst 3000 system, which consists of the Catalyst 3000 switch and the Catalyst 3000 Matrix.

Physical Specifications

Table 3-24 lists the physical specifications for the Catalyst 3000 system.

Table 3-24 Catalyst 3000 System Physical Specifications

Description	Specification
Mounting	19-inch rack-mount
Dimensions (H x W x D)	Catalyst 3000 switch: 3.5 x 17 x 13.4 in. (8.76 x 43 x 34 cm) Catalyst Matrix: 3.5 x 17 x 13.4 in. (8.75 x 43 x 34 cm)
Weight	Catalyst 3000 switch: 17 lb (7.7 kg) Catalyst Matrix: 14 lb (6.35 kg)
Input	90 to 264 VAC autoranging
Frequency	47 to 63 Hz
AC current rating	Catalyst 3000 switch: 1.5A @ 120V;.75A @ 220V Catalyst Matrix: 1.0A @ 120V;.5A @ 220V
Operating temperature range	50 to 104 F (10 to 40 C)
Storage temperature	–13 to 167 F (–25 to 75 C)
Operating humidity	8 to 80% noncondensing
Storage altitude	40,000 ft
Emissions	FCC Class A (Part 15), EN55022 A, VCCI Class 1, CE Mark
Agency Approvals	UL1950, ULC, EN 60950

External Connections

This section contains the external connection requirements for the Catalyst 3000 switch and the Catalyst 3000 Matrix.

Catalyst 3000 Switch

The Catalyst 3000 16-port switch is a stackable switch with the following external connection requirements:

- Sixteen 10BaseT Ethernet ports using RJ-45 connectors (ports 1–15 always MDI-X, port 16 can be MDI or MDI-X)
- One EIA/TIA-232 console port
- One AUI DB-15 SwitchProbe port
- One SCSI-2 port
- Two expansion module slots. The expansion modules require the following external connections:
  - 100BaseTX module: using RJ-45 connectors
  - 100BaseFL module: using ST-type connectors

Catalyst 3000 Matrix

The Catalyst Matrix is an 8-port crosspoint matrix switch used to connect from three to eight 16-port switches to create a single-stack entity.

The Catalyst Matrix has eight I/O stack ports using 50-pin SCSI-2 type connectors (one per port).

Catalyst 5000

The following section describes the physical specifications and external connection requirements for the Catalyst 5000 series switch.

Physical Specifications

Table 3-25 lists the physical specifications for the Catalyst 5000 series switch.

Table 3-25 Catalyst 5000 Series Switch Physical Specifications

Description	Specifications
Backplane	1.2-Gbps[1], 5 module connections
Dimensions (H x W x D)	10.4 x 17.25 x 18.4 in. (26.4 x 43.1 x 46.0 cm) Chassis depth including cable guide is 21.64 in. (55.0 cm)
Weight	Chassis only: 43 lb (19.5 kg) Chassis fully configured with 1 supervisor engine module, 4 switching modules, and 2 power supplies: 84 lb (39 kg)
DC voltages supplied and steady-state maximum current ratings	+5V @ 70A +12V @ 2A +24V @ 0.2A
Power supply	376W maximum (AC-input power supplies)
Power dissipation	350W maximum configuration, 110W typical with maximum configuration
Heat dissipation	563W (1919 Btu[2]/hr)
Input voltage	100 to 240 VAC wide input with power factor corrector
Frequency	47 to 63 Hz autoranging
AC current rating	8A maximum at 100-127 VAC, 4A maximum at 200 to 240 VAC with the chassis fully configured
Airflow	95 cfm[3] through the system fan assembly
Operating temperature	32 to 104 F (0 to 40 C)
Nonoperating temperature	– 40 to 167 F (– 40 to 75 C)
Humidity	10 to 90%, noncondensing
Agency approvals	Safety: UL[4] 1950, CSA[5]-C22.2 No. 950-93, and EN60950 EMI[6]: FCC Class A (47 CFR, Part 15),CE Mark, EN55022 Class B and VCCI Class 2 with shielded cables

1. Gbps = gigabits per second.
2. Btu = British thermal units.
3. cfm = cubic feet per minute.
4. UL = Underwriters Laboratory.
5. CSA = Canadian Standards Association.
6. EMI = electromagnetic interference.

External Connections

This section contains the external connections for the Catalyst 5000 modules and ports.

- The Catalyst 5000 is a 5-slot rack-mounted chassis with one slot dedicated to the supervisor engine module and a combination of modules that support online insertion and removal (OIR). External connections for the modules follow:
  - The supervisor engine module has two Fast Ethernet ports. Each port has two connectors, one MII and one RJ-45.

Note If two cables are connected to the same port, the MII is the default connection.

  - 10BaseT 24-port Ethernet switching module uses two 50-pin Telco connectors.
  - 10BaseFL 12-port Ethernet switching module uses ST-type connectors.
  - 10/100BaseTX 12-port 10/100-Mbps fast Ethernet switching module using RJ-45 connectors.
  - 100BaseTX 12-port fast Ethernet switching module using RJ-45 connectors.
  - 100BaseFX 12-port fast Ethernet switching module using ST-type fiber optic connectors.
  - ATM LAN emulation module (UTP) using RJ-45 connectors.
  - ATM LAN emulation module (single-mode and multimode fiber) using SC-type connectors.
  - CDDI module (UTP) using RJ-45 connectors.
  - FDDI module MMF (multimode fiber) using MIC connectors and (on A/B port card option) an optical bypass switch (9-pin DIN) connector.
  - FDDI module SMF (single-mode fiber) using ST-type connectors and (on A/B port card option) an optical bypass switch (9-pin DIN) connector.
  - EIA/TIA-232 data terminal equipment (DTE) port using an EIA/TIA-232 data communications equipment (DCE) console cable with DB-25 plugs at one end.
  - Token Ring UTP/STP switching module using RJ.45 connectors.
  - Token Ring multimode fiber switching module using Volition connectors.

Power Supply Requirements

The Catalyst 5000 376W AC-input power supply uses a power factor corrector that allows it to operate on input voltage and current within the ranges of 100 to 240 VAC and 47 to 63 Hz.

A second, identical power supply is also installed in the chassis configured with the redundant power option. Redundant power ensures that power to the chassis continues uninterrupted in the event that one power supply fails. It can also provide uninterrupted power in the event a power line fails, so long as the power supplies receive power from separate power lines.

Catalyst WS-C1400 Concentrator

This section contains the physical specifications and external connection requirements for the Catalyst WS-C1400 concentrator.

Physical Specifications

Table 3-26 lists the physical specifications for the WS-C1400 concentrator.

Table 3-26 WS-C1400 Concentrator Physical Specifications

Description	Specification
Dimensions (H x W x D)	2.7 x 18 x 16 in. (6.86 x 45.72 x 40.64 cm)
Weight	16 lb (7.3 kg)
Power requirements	3A @ 110 VAC, 60 Hz (WS-C1400) 1.6A @ 220 VAC, 50 Hz (WS-C1400)
Power consumption	FDDI: 90W (maximum) (WS-C1400) CDDI: 110W (maximum) (WS-C1400)
Agency approvals	CDDI/FDDI: FCC Class A (47 CFR, Part 15) CDDI/FDDI: CISPR 22 Class A FDDI: VDE Class B
Safety	UL: 1950 CSA-C22.2 No. 950-M89 IEC 950
Mounting	Desktop 19-inch rack (hardware included) Wall-mount (hardware included with optional kit)
FDDI transmit power levels: Single-mode fiber Multimode fiber	Average optical power: Maximum: –4.0 dBm Minimum: –7.0 dBm Maximum: –14.0 dBm Minimum: –18.5 dBm
FDDI receive power levels: Single-mode fiber Multimode fiber	 Average optical sensitivity: –33.0 dBm Average maximum input power: –14.0 dBm Average optical sensitivity: –34 dBm Average maximum input power: –14 dBm

External Connections

This section contains the external connection requirements for the Catalyst WS-C1400 concentrators:

- Administrative interface port: EIA/TIA-232 data communications equipment (DCE) using an RJ-45 connector (straight-through cables only).
- The WS-C1400 has two line card slots. Each slot can support one of the five optional CDDI and FDDI line cards.

  Following are the optional line cards and their connection requirements:

  — WS-X1441: eight multimode FDDI ports using MIC connectors

- WS-X1444: eight multimode FDDI ports using ST connectors
- WS-X1450: two multimode FDDI ports using MIC connectors, and CDDI/MLT-3 ports using RJ-45 connectors
- WS-X1455: ten single-mode FDDI ports using SC connectors
- WS-X1483: CDDI/MLT-3 ports using RJ-45 connectors

For network connections using FDDI-to-CDDI twisted-pair connections, you will need the optional CDD-FDDI translator.

Note To connect CDDI to shielded twisted-pair (STP), you must use an impedance-matching balance/unbalanced (balun) device.

- The chassis can be placed on a desktop, or rack-mounted in a standard 19-inch rack.

FastHub 100 Series

This section contains the physical specifications and external connection requirements for the FastHub 100 Series repeaters. The FastHub 108T and the FastHub 104T (hereafter referred to as FastHub 108T/104T) are 100BaseT-compatible, standalone, unmanaged, Class II Fast Ethernet repeaters. The eight-port FastHub 108T and the four-port FastHub 104T both support the 100BaseTX physical layer.

Table 3-27 FastHub 100 Series Technical Specifications

Description	Specification
Reliability	50,000 hours MTBF
Operating temperature	32 to 104 Fahrenheit (0 to 40 Celsius)
Operating humidity	5% to 80%
Power consumption	FastHub 108T: 25 watts (W) FastHub 104T: 15 watts (W)
Input voltage	90 to 240 V @ 50 to 60 Hz
Weight	FastHub 108T: 3.8 lbs [1.7 kg] FastHub 104T: 3.6 lbs [1.6 kg]
Width	6.3 in. (16 cm)
Depth	9.4 in. (24 cm)
Height	2.05 in. (5.2 cm)

External Connections

The FastHub 100 Series repeaters' 100BaseTX ports provide connectivity to 100BaseTXdevices using Category 5 unshielded twisted pair (UTP) cabling.

Cisco IGX 8400 Series Family

This section contains the physical specifications and external connection requirements for the Cisco IGX 8400 series wide-area switch family, which consists of the following multiservice ATM switches:

- IGX 8410 (8 slots)
- IGX 8420 (16 slots)
- IGX 8430 (32 slots)

The IGX 8400 series provides the same core ATM capabilities and Intelligent Quality of Service (QoS) Management features as the BPX 8600 series switch.

Table 3-27 lists the physical specifications for the Cisco IGX 8400 series switch.

Table 3-28 GX 8400 Series Physical Specifications

Characteristic	Description
Platforms	IGX 8410
	8-slot unit, rack mount or free-standing
	1.2 Gbps cell switching bus
	CISPR B EMI certified
	IGX 8420
	16-slot unit, rack mount or free-standing
	1.2 Gbps cell switching bus
	CISPR B EMI certified
	IGX 8430
	32-slot unit, rack mount or free-standing
	1.2 Gbps cell switching bus
	CISPR B EMI certified
Power	Distributed 48V DC power conversion on modules 220/240 VAC AC-DC converter, 1:n redundant
Control processors	Network processor module (NPM) 68040 CPU
	System clock module (SCM), internal or external clocking
Alarm modules	Alarm relay module (ARM)
	8 normally open contacts
	6 normally closed contacts

Table 3-28 GX 8400 Series Physical Specifications (Continued)

Characteristic	Description
Voice service modules	Channelized voice and data module (CVM)
	32-, 24- and 16-Kbps ADPCM voice compression (ITU G.721, G.723 and G.726)
	Voice activity detection (VAD)
	Integrated FAX/high-speed modem detection and optional echo cancellation
	Supports T1, E1, J1 interfaces
	Universal voice module (UVM)
	32 Kbps, 24 Kbps ADPCM and 16 Kbps LD-CELP voice compression (ITU G.721, G.723, and G.728)
	Voice activity detection (VAD)
	On board echo cancellation.
	Fax and modem tone detection
	Supports T1,E1, and J1 interfaces
Circuit switched data service modules	High-speed data module (HDM)
	Up to 4 channels, each up to 1.344 Mbps
	Supports EIA/TIA-232, V.35, EIA/TIA-422, EIA/TIA-449, X.21/V.36 interfaces
	Repetitive pattern suppression (RPS) to 128 Kbps
	Low-speed data module (LDM)
	Up to 8 channels
	Supports EIA/TIA-232 interface
	Repetitive pattern suppression to 19.2 Kbps

Table 3-28 GX 8400 Series Physical Specifications (Continued)

Characteristic	Description
Frame Relay service modules	All Frame Relay service modules conform to the following:
	CCITT 1.122 (ANSI T1/S1)
	T1.606—Services description of Frame Relay bear service
	T1.606 addendum—Congestion management
	T1.617 (Annex D)—Signaling specification for Frame Relay
	T1.618—Core aspects of Frame Relay
	Includes fully standard handling of DE, FECN, and BECN bits
	Frame Relay module (FRM)
	Up to four channels, totaling 2.048 Mbps
	Supports V.35, EIA-TIA/422, EIA/TIA-449, X.21/V.36, and T1/E1 (channelized and nonchannelized) interfaces.
	Frame Relay module (FRM-31)
	Up to 31 logical ports
	Frame Relay module (FRM-2)
	T1/E1 (channelized and nonchannelized) interfaces
	X.21 1/f for port concentrator shelf
	Universal Frame Relay module (UFM-C)
	8 ports T1/E1 (channelized or unchannelized)
	Universal Frame Relay module (UMF-U)
	Supports 12 V.35/X.21 ports per card
	Supports four HSSI ports per card
ATM Service Modules	ATM line module (ALM/A)
	Supports unchannelized T3/E3 with 45 Mbps throughput UNI 3.0 portside interface CBR, VBR, and C.S support
	64,000 cells of buffering
	Supports up to 1500 connections per card
Network trunking modules	Network trunking front module (NTM)
	Trunk sppeds from 128 Kbps to 2.048 Mbps
	Supports T1/E1, Japanese J1 trunk interfaces
	Broadband ATM trunk module (BTM)
	ITU 53-byte cell standard
	Supports T3/E3 and HSSI interfaces
	Multipoint logical trunking over ATM service
	ATM Line module (ALM/B)
	Supports unchannelized T3/E3 with 45 Mbps throughput
	Full CCITT ATM compliance
	Frame trunk module (FTM)
	FastDLC, FrameClass, Frame Relay service compatible protocol
	Frame trunk speeds from 9.6 Kbps to 512 Kbps
	Supports V.35, T1, E1 and X.21 interfaces

Processor Functions

The IGX 8400 series has a processor card group that controls communication between the cards in the node and the system bus. This card group also controls communication to other nodes in the network, and performs system timing, network control, and status reporting functions.

Processor Card Group

The processor card group consists of the network processor module, system clock module, and alarm relay module.

- Network processor module (NPM)

  The NPM is a microprocessor-based system controller that contains the software for controlling, configuring, and monitoring the IGX 8400 switch.

- System clock module

  The system clock module provides a centralized clock generation function for the IGX 8400 series switch. Each IGX 8400 must have a system clock module; a single system clock module can support redundant NPMs.

- Alarm relay module (ARM)

  The ARM includes visual alarm indication, a set of relay outputs, and an alarm history indication.

ATM Services

The IGX 8400 series provides ATM services at broadband speeds. IGX 8400 ATM interfaces support LAN connections across the wide area and seamlessly operate across the Cisco product families, while providing high performance through user fairness, high throughput, and low discards.

Frame Relay Services

Standards-compliant Frame Relay services from IGX 8400 switches achieve high-throughput, low-delay, and low-discard connectivity for LAN interconnect and legacy FRAD traffic. Port speed options range from 56 kbps to 2.048 Mbps. A Port Concentrator Shelf (PCS) can be used in conjunction with the IGX 8400 switch for higher-density, lower-speed Frame Relay ports. Standard interfaces include V.35, S.12, and channelized T1 and E1 for up to 31 logical ports per physical port.

Port Concentrator Shelf

The IGX 8400 series Port Concentrator Shelf dramatically increases the Frame Relay port capacity and speed range of the IGX 8400 series switch. A fully loaded PCS expands the capacity of each IGX Frame Relay card to support 11, 22, 33, or 44 ports with a wide range of sub-T1/E1 port speeds.

The modular PCS hardware lets you tailor each IGX 8400 series switch for specific applications. Modules are available with V.24/V.28, V.11, or V.35 DCE and/or DTE interfaces. For applications requiring multiple types of interfaces, interface daughter boards can be mixed and matched on a per-interface basis. You can insert up to four PCS modules into a PCS shelf. Modules can be hot-swapped without affecting service to other ports on the shelf.

Voice Services

IGX 8400 series switches provide efficient, high-quality voice connectivity to digital PABX through standard interfaces. The IGX 8400 series is the industry's first ATM switch with voice using both voice compression and silence suppression.

Circuit-Switched Data Services

Circuit-switched data services on the IGX 8400 series include the following features:

- Transparent data service
- Flexible clocking
- Repetitive pattern suppression—circuit data compression
- Circuit switched data service modules

Trunk Resources

The IGX trunk modules include the network trunk module, broadband ATM module, ATM line module, and frame trunk module.

BPX 8600 Series Wide Area Switch

This section contains the physical specifications and external connection requirements for the BPX 8600 Series wide-area switch.

Table 3-28 lists the physical specifications of the BPX 8600 series.

Table 3-29 BPX 8600 Series Switch Physical Specifications

Characteristic	Description
15 module slots	2 slots reserved for redundant control and switch modules
	1 slot reserved for Alarm Status Monitor (ASM) module
	12 slots for general-purpose function modules
Dimensions (H x W x D)	22.75 x 17.72 x 27 in. (57.8 x 45 x 68.6 cm)
	19 in (48.3 cm) rack mountable
Power requirements	-48VDC or 208/240VAC input
	1400W dissipation (max)
Crosspoint switch fabric	Switch capacity of 20 Gbps
	12 800-Mbps switch ports that can support up to OC-12 cell rate
	Arbiter establishes up to 20 million cell connections per second
Network interfaces	T3 (44.736 Mbps) with PLCP per TA-TY-000773
	OC-3/STM-1 (155.520 Mbps) complies with SONET framing per ANSI T1.105
	E3 (34.368 Mbps) per ITU-T Rec. G.804
	SDH framing per ITU-T Rec. G.708
	OC-12/STM-4 (622.08 Mbps), complies with SONET standards
	Bellcore GR-253-CORE, ANSI T1.105; complies with SDH standards ITU-T G.708 and G.709; ITU-T G.957 and G.958
Common network interface features	Up to 16 programmable queues for class-based or VP/VC-based queuing
	Queues programmable by maximum queue depth, minimum service bandwidth, maximum service bandwidth, cell loss priority (CLP) thresholds, EFCI thresholds
	ForeSight closed-loop, rate-based congestion management
	Fully compliant ABR VS/VD implementation per ATM Forum Specification V.4.0
	Explicit rate (ER) marking
	EFCI marking
Broadband service interfaces	Conformance to ATM Forum Specification V.3.1:
	T3/DS-3 UNI (44.736 Mbps)
	OC-3 UNI (155.520 Mbps) SONET
	OC-12 UNI (622 Mbps) SONET
	E 3UNI (34.368 Mbps)
	STM-1 UNI (155.520 Mbps) SDH
	STM-4 UNI (622.08 Mbps) SDH

Table 3-29 BPX 8600 Series Switch Physical Specifications (Continued)

Characteristic	Description
Optional redundancy	All components are optionally redundant to 100 percent system redundancy, including the control processor, crosspoint switch, network interfaces, service interfaces, critical backplane signals, power supplies, power modules, and cooling fans
Network management	Interfacing to network management is provided by SNMP connection via: 1 802.3 AUI interface for local connection to StrataView Plus 2 asynchronous control/printer ports
Alarms, indicators, and controls	Major node alarm, minor node alarm, alarm cut-off, and history indicators Visual and audible (major and minor) relay closures provided for connection to central office alarm system, including power supply status indicators and LAN activity indicator Each interface module has a minimum of three visual indicators: Active (green), Standby (yellow), and Fail (red)
Node synchronization	Stratum 3 clock per ATT PUB 62411 Software programmable source: internal clock, transmission line, auxiliary port to an external clock source

Services

The BPX 8400 series supports the following services:

- Internet/intranet

  The BPX 8600 series switch aggregates Internet and intranet traffic, supports a full range of access options, and scales services to accommodate from hundreds to thousands of subscribers on a single node. Advanced traffic management capabilities provide the highest throughput and trunk use without risk of cell loss.

- ATM

  The BPX 8600 series switch supports a wide range of interfaces for data traffic including ATM, Frame Relay, SMDS, LAN, SNA, X.25, Internet, and broadband video. Traffic is switched at speeds up to 622 Mbps.

- Switched interworking

  The BPX 8600 series switch provides a reliable platform for delivering transparent or high-speed LAN-to-LAN solutions for Ethernet, Fast Ethernet, Token Ring, and FDDI traffic across a metropolitan or global backbone.

- Frame Relay

  The BPX 8600 series switch provides a smooth migration path to ATM and broadband services with complete service interworking.

- Voice

  The BPX 8600 series switch provides the advanced traffic management features and class-of-service (CoS) guarantees required for delivering real-time, high-quality voice applications.

- Video

  The BPX 8600 series switch delivers the required quality of service (QoS) for video over ATM applications including video-on-demand, videoconferencing, and video telephony.

- Wireless

  Support is available for analog and digital cellular, wireless data, and enhanced specialized mobile radio (ESMR) services from a single BPX 8600 switch.

  Broadband and Narrowband Services

  The BPX 8600 series switch has a modular design that supports the following broadband and narrowband user services:

- Broadband shelf
- Virtual trunking
- Multicast
- Tag Switching
- Broadband Shelf

  The broadband shelf provides a 20-Gbps crosspoint switching fabric in a 15-slot chassis. Three slots are reserved for common control modules, and 12 slots are provided for interface modules. The switch has a midplane design, and each front card has a corresponding line module providing the physical interface to the transmission media. This design permits easy upgrading or replacing of function modules without disturbing cabling.

  The broadband shelf design includes four functional card groups: the common core group, the broadband switch group, the service interface group, and the network interface group. A separate network management interface provides the connection to the StrataView Plus network management platform.

Common Core Group

Common core cards provide the following functions:

- ATM cell switching
- Internal and remote node communication
- Node synchronization
- Network management communication
- Shelf management communication
- Alarm and status monitoring

The broadband controller card is a microprocessor-based system that is used to control the overall operation and provide circuit switching for the BPX 8600 switch. The broadband controller card is a front card that is usually equipped as a standard pair, which is a system option. Slot 7 and Slot 8 are reserved fro the primary and secondary, or standby, broadband controller cards. Each broadband controller card requires a corresponding redundant line module back card.

There are three broadband controller interface cards:

- BCC-4

The BCC-4 is a new 19.2-Gbps control card that enhances the potential of Stratm technology in nodes equipped with BXM function modules. The BCC-4 provides enhanced processing power for general administrative node functions and provides the BPX with a 16 x 32 switching matrix. The BCC-4 supports 4 MB of BRAM and 128 MB of DRAM.

The BCC-4 is fully compatible with legacy function modules (BNI, ASI), which use one 800 Mbps input and one 800 Mbps output link. The new BXM modules and the BCC-4 cards feature the dual receiver serial interface unit (DRSIU) ASIC that takes advantage of the two 800 Mbps in output direction.

- BCC-3-32, BCC-3-64

  The BCC-3-32, BCC-3-64 control cards include a 16 x 16 switch fabric that provides 9.6 Gbps of peak throughput.

- The ASM card has the following features:
  - Front card and associated back card (ASM-BC)
  - One card required per node
  - Support functions—Telco-compatible alarm indicators, controls, relay outputs, node power monitoring, monitoring of shelf cooling fans and temperature, sensing for presence of other cards installed in the BPX 8600 shelf.

Broadband Switch Group

The broadband witch module cards (BXM), designed with Stratm technology, provide standard interfaces for connecting to cell-based customer premises equipment (CPE) through ATM User-Network Interface (UNI) or to non-Cisco networks through a Network-to-Network (NNI) interface. Stratm technology provides the industry's first ATM Forum-compliant (TM V.4.0) available bit rate (ABR) virtual source/virtual destination (VS/VD) capability in custom ASICs.

There are three high-density BXM card types:

- BXM-T3/E3

The BXM-T3/E3 is a T3/E3 ATM interface card for the BPX 8600 switch. This interface card provides either 8- or 12-T3/E3 ATM ports per card, with a card configuration option for trunk or UNI applications. The BXM-T3/E3 supports 16,000 or 32,000 connections per card. The supporting back card options provide up to 12 ports and can be used with the 8-port BXM or the 12-port BXM.

- BXM-155

  The BXM-155 is an OC-3c/STM-1 ATM high-capacity interface card for the BPX 8600 series switch. Operating at the standard SONET/SDH rate of 155.520 Mbps, this interface card provides either 4- or 8-OC-3c /STM-1 ATM ports per card, which can be configured for trunk or UNI applications. The BXM-155 supports 16,000 connections per card. Multimode, single-mode, and single-mode long reach optical interfaces are available.

- BXM 622

  The BXM-622 is an OC-12c/STM-4 ATM high-capacity interface card for the BPX 8600 series switch. Operating at the standard SONET/SDH rate of 622,08 Mbps, this interface card provides either 1- or 2-OC-12c/STM-4 ATM ports per card, which can be configured for trunk or UNI application with full bi-directional 622-Mbps (OC-12/STM-4) throughput per slot in the BPX 8600 switch. The BXM-622 supports 16,000 or 32,000 connections per card. Single-mode, single-mode long reach, and 1550 nm extra long reach optical interfaces are available.

Service Interface Group

ATM service interface (ASI) modules provide standard interfaces for connecting to cell-based customer premises equipment (through an ATM UNI standard user interface) or to non-Cisco networks through an NNI network interface).

ASI modules support native ATM session at speeds of T3/E3 and OC-3/STM-1. [On the BPX 8600/MGX 8220 interface, service interface cards support speeds of T1/E1 inverse multiplex ATM (IMATM).] These interfaces enable configuration of permanent virtual circuits (PVCs) or switched virtual circuits (SVCs) for the following service classes:

- Constant bit rate (CBR)
- Variable bit rate real time (VBR-RT)
- Variable bit rate no-real time (VBR-N-RT)
- Unspecified bit rate (UBR)
- Available bit rate (ABR)

ASI modules support up to 16 classes of service, and both ATM to Frame Relay network interworking and service interworking to give them the ability to handle all currently defined ATM traffic types, and future types.

- The ASI-2-T3/E3 card has the following features:
  - Two 45-MB T3 ATM ATM UNI/NNI ports
  - Maximum of 1000 connections per card
  - 64,000 cells of input buffering allocated per-virtual circuit
  - Aggregate transport rate of 96,000 cps per port (T3) or 80,000 cps (E3)
  - Operation with a corresponding T3 or E3 back card (BPX-T3-BC-EX-BC)
- The ASI-155E card has the following features
  - 2-port OC-3 SONET/SDH (155.520 Mbps, 353,208 cells per second)
  - 8-K cell input VBR buffer, 32-K cell output buffer
  - Usage parameter control to control admission to the network
  - Operation with a corresponding back card (SMF-2-BC, single-mode, intermediate; SMFLR-2-BC, single-mode long range; MMF-2-BC, multimode.

Network Interfaces Group

Broadband network interface modules (BNI-T3, BNI-E3, BNI-155) connect the BPX Service Node to other BPX, IGX or IPX nodes. These modules support up to 16 classes of service and network interfaces at speeds of T3/E3 and OC3/STM-1. Network interfaces and n x T1/E1 are supported by the inverse multiplexting for ATM trunk model on the AXIS multiservice concentrator.

- The BNI-T3 and BNI-E3 cards have the following features:
  - Three broadband data ports operating at 44.736 Mbps (T3) or 34.368 Mbps (E3)
  - Trunk transmission of up to 96,000 cells per second (T3 trunks) or 80,000 calls per second (E3 trunks)
  - 24,000 cell buffers per port
  - Card operation as a pair with corresponding back card (BPX-T3-BC and BPX-E3-BC)

- The BNI-155 card has the following features:
  - BPX interface with ATM OC-3/STM-1 broadband trunks
  - Three back cards: SMF-2-BC, single-mode intermediate (20 km); SMFLR-2-BC, single-mode long range (40 km); MMF-2-BC, multimode (2 km)
  - Up to 353,208 cells per second
  - 8-K cell input VBR buffer, 32-K cell output buffer

MGX 8220 Edge Concentrator

Table 3-30 MGX 8220 Edge Concentrator Specifications

Description	Feature
16 slots	6 slots reserved for common control cards
	10 slots available for function modules
Dimensions	8.75 x 17.45 x 22 in. (21.8 x 43.6 x 50 cm)
(H x W x D)	19 in. (48.3 cm) rack mountable
Power requirement	-48 VDC or 110/220 VAC
	400W
	Redundant power feeds
Capacity	640-Mbps ATM cell bus
Subscriber interfaces	T1/E1 Frame Relay (fractional and channelized)
	High-speed Frame Relay
	ATM Frame user network interface
	n x T1/E1 IMA UNI
	T1/E1 ATM
	T1/E1 Circuit emulation
	SNA/SDLC
	Bisync
Trunk interfaces	T3/E3
	SONET STS-OC-3/STM-1
	IMA (T1/E1)
Optional Redundancy	1:1 optional common equipment redundancy, including control processor network interfaces, power supplies
	Optional 9:1 subscriber interface redundancy
Network management	SNMP configuration and monitoring
	Trivial File Transfer Protocol (TFTP) software download
	TFTP statistics collection
Connection management	PVCs or SVCs